The Reclaimed Water Distribution System

The City of Sunnyvale is implementing a water reclamation project in two phases. Phase I, now complete, is a pipeline that carries treated effluent from the WPCP to serve Lockheed, Moffett Field Golf Course, and the Sunnyvale Golf Course. Phase II will consist of a series of pipelines to serve other parks and industrial areas in the north part of the City. The total potential average annual reclaimed water demand for both phases, including landscape irrigation, industrial, commercial, and government, is estimated at 3.5 mgd (0.7 mgd for Phase I and 2.8 mgd for Phase II).

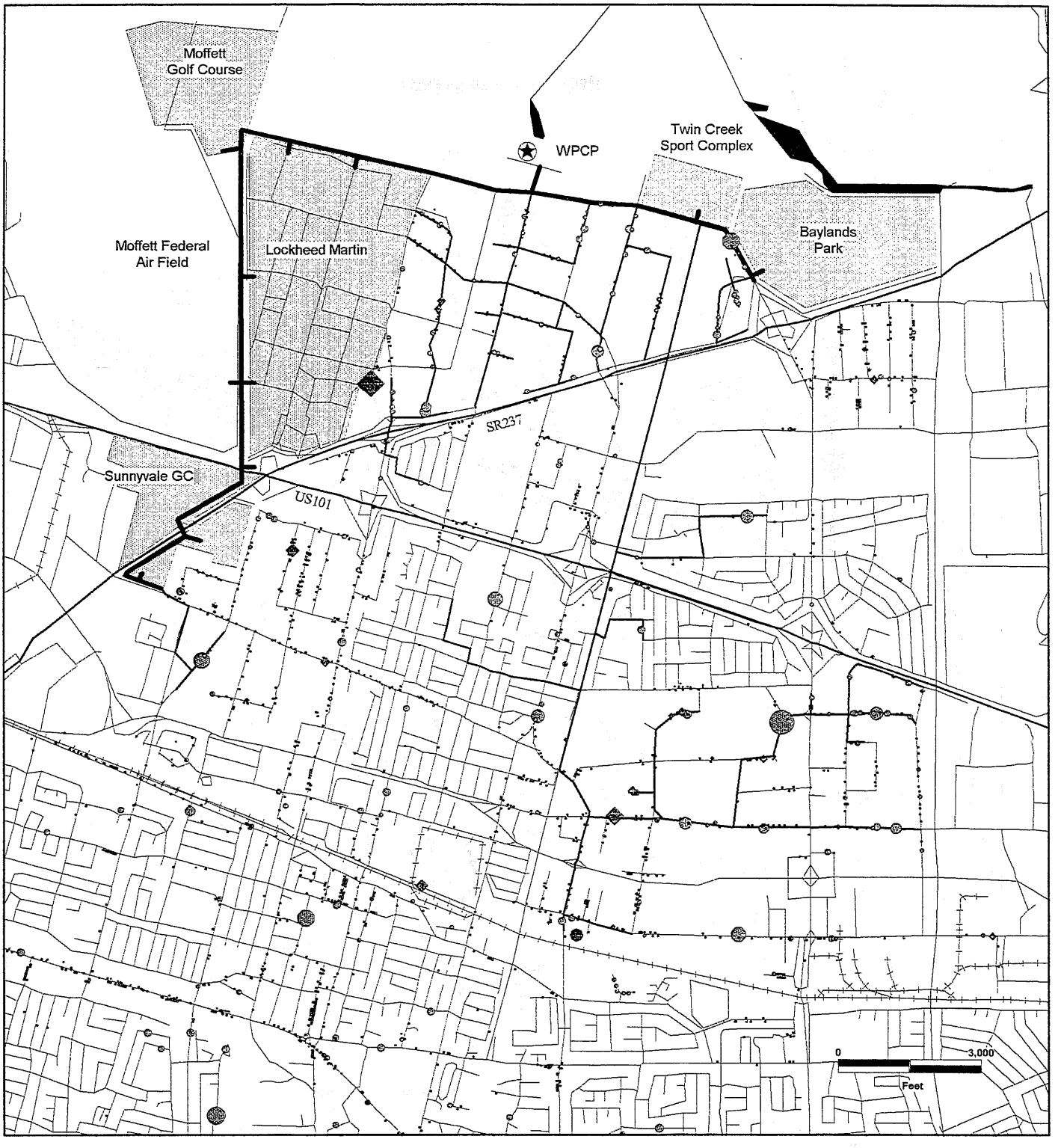
The Sunnyvale Water Reclamation Program is designed to distribute reclaimed water throughout the City for irrigation of schools, parks, and golf courses, and groundwater recharge. The system could extend beyond the City limits to serve entities in Los Altos and Cupertino if economically feasible. The City is also a participant in a regional project to evaluate the feasibility of exporting the reclaimed water from the San Francisco area to the Salinas Valley and the Central Valley for agricultural irrigation uses.

The ability to utilize up to 100% (12.5 to 18.5 mgd) of the output of the WPCP will depend on available opportunities outside the City limits. Figure 2 shows the existing and estimated non-residential landscape demand for reclaimed water that will be served in Phases I and II.

Baylands Park distribution facilities were first constructed to include 24- to 36-inch diameter pipelines that extend from the WPCP and Borregas Avenue east along Caribbean Drive to Baylands Park. Distribution pipelines will be constructed west and south to convey reclaimed water throughout the City. Phase I also includes a pump facility at the WPCP and a pipeline from the WPCP and Borregas west to serve Lockheed/Martin, golf course and agricultural lands at Moffett Federal Air Field, Caltrans freeway landscape, and the Sunnyvale Golf Course.

Phase II, consisting of 88,000 feet of pipeline and a pumping/storage plant, has been divided into three subphases. Phase IIa, to be constructed in 1996, covers the industrial area north of Highway 237. Phase IIb, currently being designed, includes a trunk pipeline southward down the East Flood Control Channel to Wolfe Road and Kifer Drive, a pumping/storage facility at the Industrial Well plant with a 2 million gallon ground level storage tank, and additional distribution pipelines. Phase IIc is planned to extend eastward from Wolfe Road along Arques Avenue and into the East Duane Industrial area north of Arques Avenue. Figure 3 shows both existing and proposed pipelines for Phases I through IIc.

Although not currently budgeted, Phases III through VIII would include facilities to serve the west side of Sunnyvale, extensions into Cupertino and Los Altos, and the east trunk line southward from Kifer Drive, respectively (Figure 4).



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Sunnyvale Existing & Estimated Non-Residential Landscape Demand

Estimated demand is equal to 30% of the industrial & commercial demand at sites without landscape meters.

City of Sunnyvale
Water Recycling Program

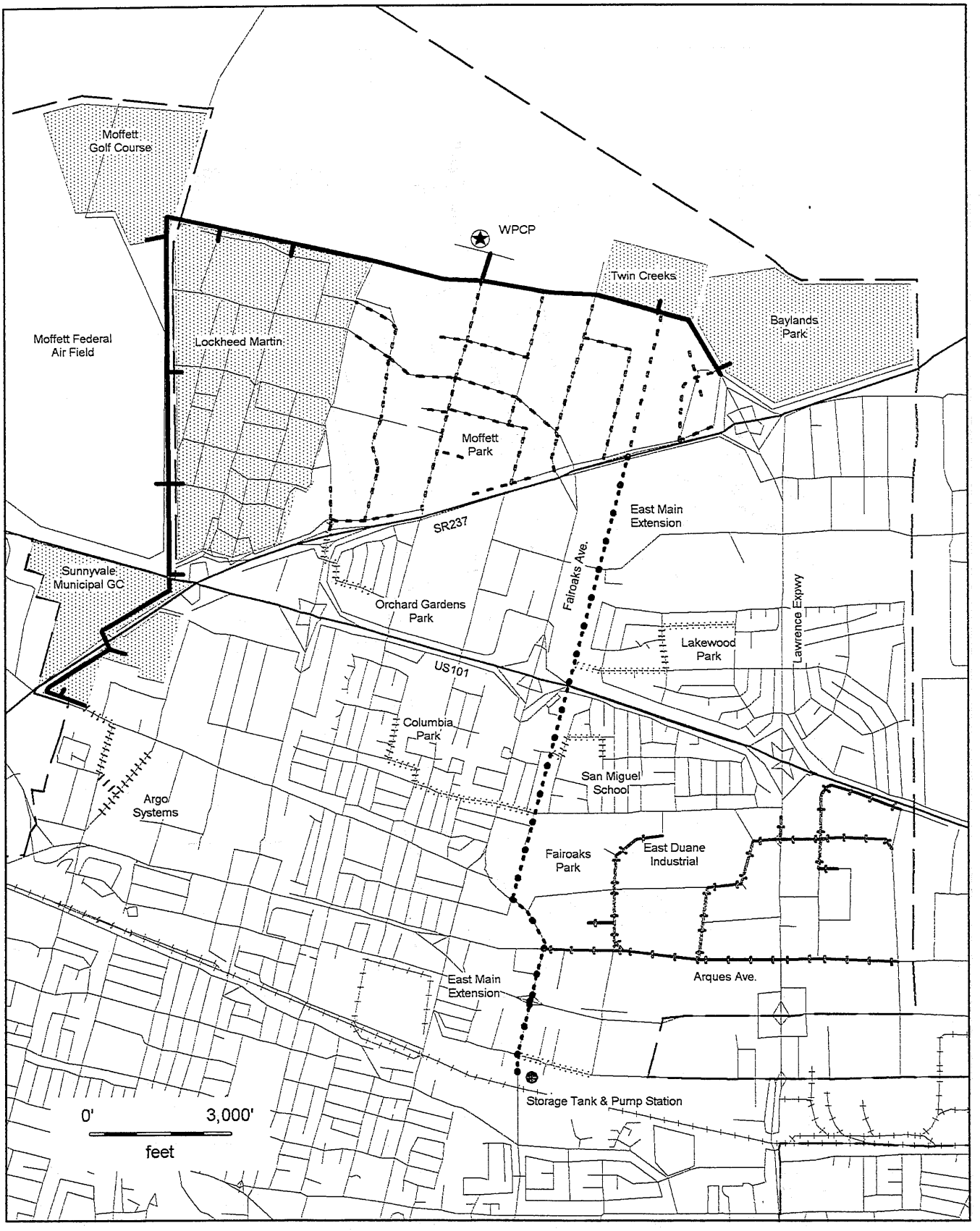
Legend

Phase I Baylands	
Phase IIa, b, & c	
Demand (CCF)	1 — 100,000
Existing Landscape	
Estimated Landscape	

Figure No. 2

EOA, Inc.

May 1996



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Phase I & II Pipeline Alignment

City of Sunnyvale
Water Recycling Program - Master Plan

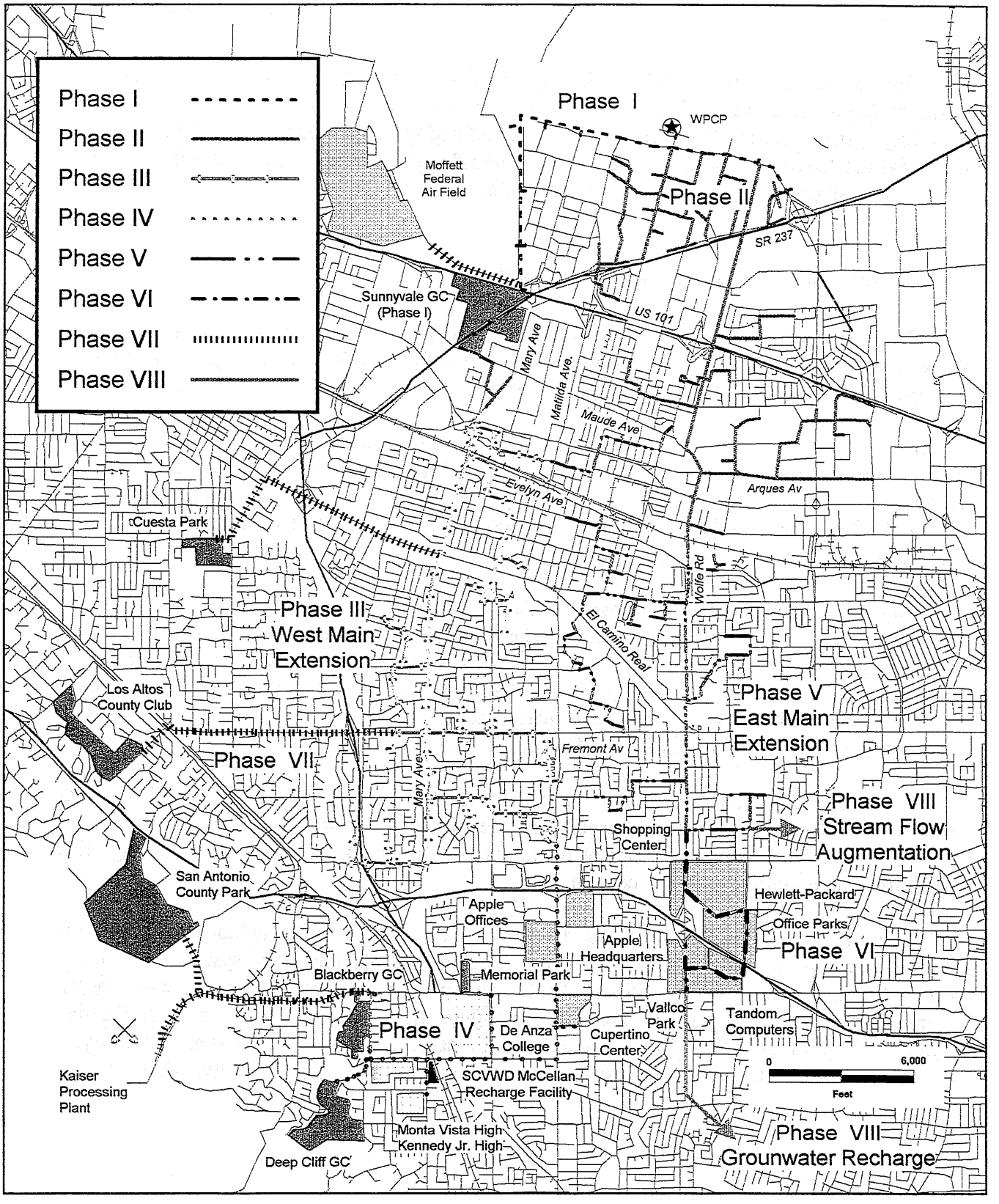
Legend

- Phase I
- Subphase IIa - Moffett Park
- Subphase IIb - Main Extensions
- Subphase IIc - E Duane Ind Area
- Subphase IId - Parks & Playgrounds

Figure No. 3

EOA, Inc.

May 1996



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Recycled Water Distribution

Note: Sunnyvale Golf Course shown as an area scale.

City of Sunnyvale
Water Recycling Program - Master Plan

Legend

- Parks & Golf Courses
- Schools/Colleges
- Office Parks/Commercial
- Recharge Facility

Figure No. 4

EOA, Inc.

May 1996

The City's reclaimed water is of the highest quality for non-potable use. It meets the California Code of Regulations Title 22 non-restrictive irrigation use criteria and is suitable for uses including agricultural and landscape irrigation, toilet and urinal flushing, construction site uses, industrial uses such as cooling, non-body contact landscape and/or recreational impoundments, stream flow augmentation, and wetland enhancement.

Operation and Maintenance of the Facilities

The City has an annual program to inspect and provide required maintenance for storage tanks. All active tanks are constructed of steel and have a life of over 100 years if properly maintained. The oldest tank has been in service for 40 years.

All of the City's water services are metered. A meter maintenance program is in place to maintain accuracy, including routine testing, repair, and replacement. Based on the meter reading total, the system loss was estimated to be 6% of the average annual production in fiscal year 1994/95. American Water Works Association (AWWA) Standards for Municipal Utilities indicate a system loss of 10% or less is desirable.

The City's 3,280 fire hydrants are continuously maintained for flow testing, cleaning, painting, and color coding to indicate flow rates. The location and placement of these hydrants are determined by the Fire Prevention Division of the Public Safety Department. Backflow preventers are installed by property owners. These devices are subject to the City's approval, annual inspection, and testing. To ensure that these devices always function properly, the City may obtain ownership of all backflow devices from private owners in the future.

To allow system automation, a Supervisory Control and Data Acquisition (SCADA) System was installed in 1967. Since then, the system has been upgraded to incorporate newer technology to increase system reliability. Improvements include pressure and water level sensing, flow monitoring, and automatic pump control.

The SCADA control center, located at the City's Corporation Yard, includes a primary and redundant computer control system, a data concentrator, and telemetry system with remote terminal units at various City facilities. With a laptop computer and modem, the water system operators have the ability to receive and respond to system alarms at any time of the day. Continuous upgrades of the SCADA system will be necessary to maintain system reliability, as the existing electronic equipment becomes obsolete and parts are no longer available.

Water Demand and Demand Management

From 1987 to 1992, California experienced a prolonged drought, which caused severe water shortages requiring water rationing in Santa Clara County from 1989 to 1992. Through the cooperative efforts of water retailers and their customers, Santa Clara County endured the drought with minimal economic and aesthetic impacts. This section presents the water demand by different user categories and demand management practices used to maximize the availability of water supply during the drought.

Water Demand

Existing demand is based on billing and consumption records from the City's Finance Department. The City experienced a decrease in water consumption between 1984 and 1993 primarily due to water conservation in the residential, commercial, and industrial sectors.

Future water demand at buildout can be projected by applying unit consumptions for the residential and industrial/commercial sectors to the buildout assessment on population and acreage.

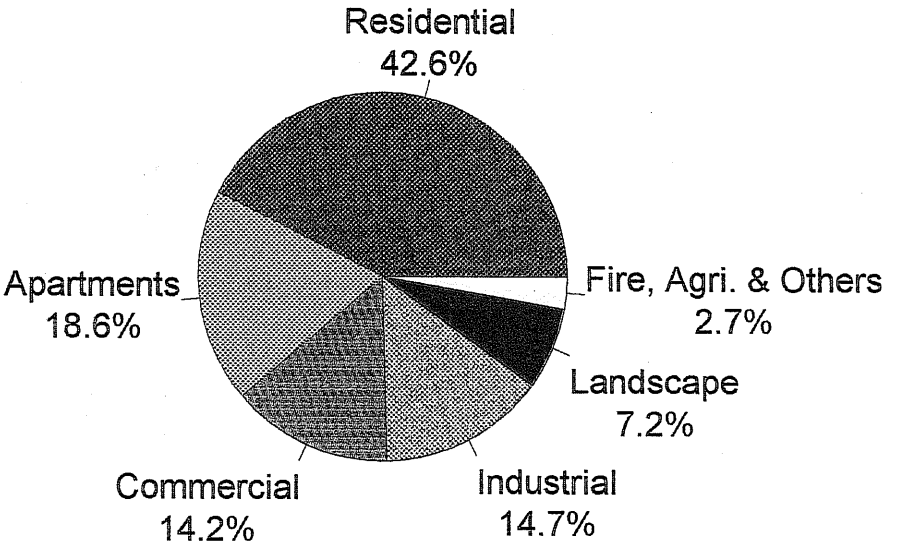
Unit consumption for residential and industrial/commercial development is derived from current consumption and demographical data provided by the City's Community Development Department. Future unit consumption is assumed to be similar to the current level because landscape irrigation systems have become more efficient, public awareness of water conservation has increased, and low-flow toilets and showers have been installed as plumbing codes are being revised.

The buildout water demand is estimated to be 23 mgd, which is 23% greater than the current water consumption. The buildout assessment was based on the assumption that all available land in the City will be developed to the maximum extent allowed by current zoning, including new buildings on vacant land and some redevelopment of existing developed land.

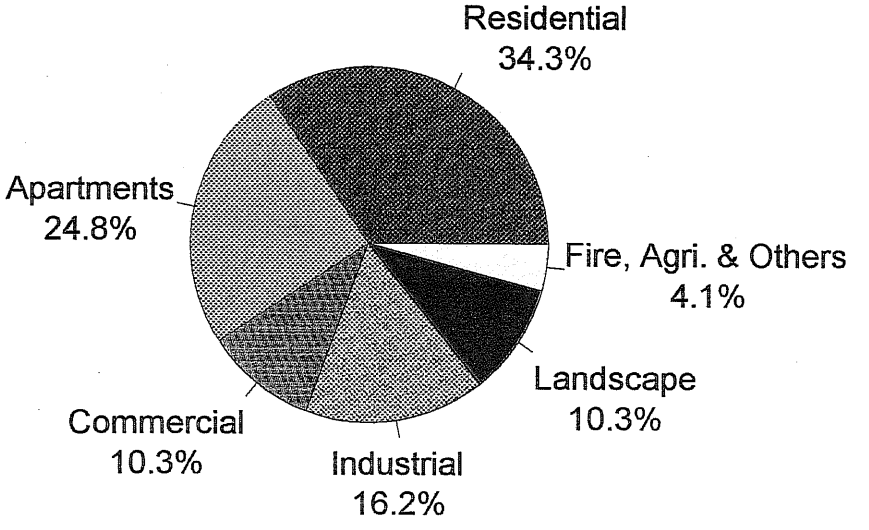
The graph on the following page shows annual water consumption for calendar years 1984 and 1993 by user category.

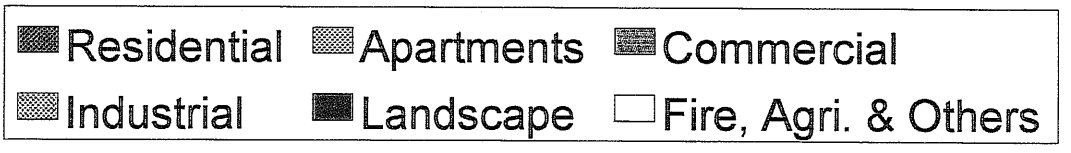
Annual Water Consumption by User Categories

Year 1984



Year 1993





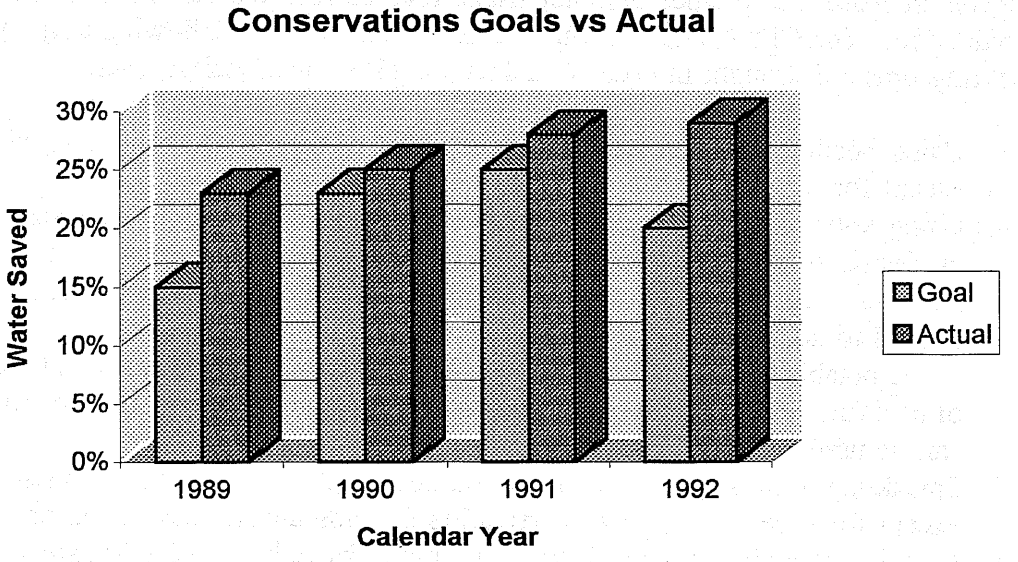
Demand Management Practices

In March 1989 the City of Sunnyvale adopted water conservation plans that required implementation of demand management, including strengthening the inverted rate structure, mandatory water conservation, and implementing best management practices. A 23-29% reduction was achieved, and conservation goals were met.

- **Inverted Rates.** Prior to the 1976-1978 drought, the City had a traditional declining rate block structure, which meant that the more water used, the lower the cost per unit. In 1977, a flat block rate was established with costs fixed regardless of the quantity used. In the year following the drought, an inverted rate structure was adopted and is regularly modified to ensure water conservation and to adequately reflect the high cost of developing new water resources projects.

  With the 1995/96 inverted rate structure, each user category has between one and seven rate blocks (Appendix A). The first rate block represents the lifeline rate, which is a minimum rate for basic water requirements of customers. This block provides up to 600 cubic feet of water for all user categories except landscaping, which is considered a non-essential water use. The minimum rate block provides a residential customer approximately 150 gallons per day (gpd), considered adequate for indoor use for a family of three to four people. For the other rate blocks, rates increase with increased water usage to encourage water conservation.

  Inverted rates coupled with an active public education program proved to be effective in achieving all rationing goals throughout the drought. The following graph shows water rationing required and the results achieved during the drought years.



- **Current Water Usage Restrictions.** The following is a listing of current non-essential water practices that are prohibited in Sunnyvale:

  a. Allowing or maintaining broken or defective plumbing, sprinklers, watering or irrigation systems which permit the escape or leakage of potable water.
  b. Using potable water in any manner which causes, allows or permits the flooding of any premises, or any portion thereof, or which causes, allows or permits water to escape from any premises or any portion thereof and flow into gutters, streets, or any surface water drainage system.
  c. Using any hose or similar device using potable water for washing automobiles, trucks, buses, boats, trailers, equipment, recreational vehicles, mobilehomes or other vehicles or machinery, unless the hose or device is equipped with a positive automatic shutoff valve.
  d. Using potable water to wash sidewalks, driveways, filling station aprons, patios, parking lots, porches or other paved or hard surfaced areas, unless there is a positive automatic shutoff valve on the outlet end of the hose.
  e. The service of water by any restaurant or other eating or refreshment establishment to any patron, except upon the specific request by a patron for such services.
  f. Installation of any single pass cooling process in new construction.
  g. Any use of nonpotable water not in compliance with all federal, state and local laws, rules and regulations. Use of reclaimed water from the City's Water Pollution Control Plant shall be subject to the discretion of the Director of Public Works.

- **Drought Water Usage Restrictions.** Water agencies in Santa Clara County have developed uniform, county-wide water usage restrictions during periods of drought. Non-essential water uses are identified and prioritized. As conservation or rationing levels increase, more types of water usage may be restricted to meet the new levels of reduction. The City Council of Sunnyvale has adopted the following usage restrictions during times of drought in order to achieve a 25% conservation level:

  a. Using potable water for washing the exterior of dwellings, buildings, or structures, except for windows.
  b. Using water to clean, fill, or maintain operating levels in decorative fountains, ponds, or similar ornamental structures, except for required equipment maintenance, or to maintain water levels in those ponds to support flora and fauna, including but not limited to ducks, fish, and aquatic plants.
  c. Using potable water for construction purposes, such as dust control and consolidation of backfill, unless no source of reclaimed water is available and no alternative method can be used.
  d. Sprinkling, watering, or irrigation of outdoor landscaping between sunrise and sunset, except for necessary testing of irrigation systems during installation or repair.
  e. Flushing of hydrants, except where required for public health or safety.

The City is prepared to achieve a 35% goal with the following additional restrictions:

a. No new installations of plants, shrubs, trees, lawns, or other plants as long as this level of water use reduction is in effect,
b. New landscape construction would be allowed for the purposes of installing mounds, hardscape, or any other landscape facility that does not include living plant materials. Irrigation systems would have been installed but not hooked up to the public water supply.
c. No new construction of swimming pools or ponds.
d. No filling or refilling of swimming pools. Use of water to replace evaporation loss in pools would be allowed.
e. No outdoor watering from December through March.

In case of a severe drought, the City is also prepared to achieve a 45% conservation goal by adding the following restrictions:

a. No watering of turf, grass, or dichondra lawns. Shrubs, bushes, trees, and groundcovers would receive minimal watering only. Turf or grass areas specifically identified as organized sports playing fields would receive minimal watering only.
b. No watering of golf courses except for tees and greens.

- **Implementing Best Management Practices.** During the 1987 to 1992 drought, the State Department of Water Resources required that all major water suppliers in California enter into a memorandum of understanding with the Department for the purpose of implementing best management practices for water conservation. The Santa Clara Valley Water District took the lead for many of the County water retailers in developing best management practices as part of a long-term water conservation plan, of which the City of Sunnyvale was a cosignatory. Applicable elements of the plan included:

  a. Performing water audits for residential and commercial/industrial customers.
  b. Implementing an ultra-low flush toilet rebate program.
  c. Implementing and supporting water reclamation projects.
  d. Establishing outreach programs for schools and other interest groups.
  e. Providing information for consumers regarding low-water-using plants and efficient irrigation systems.

  The City has been involved in all these activities and will continue to enhance these programs in the future. Appendix C contains a more detailed description of these activities.

Water Quality Management

This section summarizes the federal and state drinking water requirements, the City's water quality monitoring program, and the compliance status of the City's water supply.

Federal Safe Drinking Water Act and State of California Code of Regulations Title 22

In 1974, the Safe Drinking Water Act (SDWA - Public Law 93-523) was passed in response to concerns about organic chemical contaminants in drinking water and ineffective state supervision of public drinking water supplies. The SDWA required the Environmental Protection Agency (EPA) to set enforceable standards for health-related drinking water contaminants and to apply these standards to all public water systems serving at least 25 persons. It also required that operators of some 60,000 public water systems in the country monitor the quality of potable water being delivered to the customer and provide the necessary treatment to assure regulatory compliance.

The SDWA specifies two categories of drinking water regulations. Primary regulations, which are health-based and enforceable, specify maximum contaminant levels (MCLs) of contaminants and/or treatment requirements. Secondary regulations are nonenforceable federal guidelines for the aesthetic quality of drinking water, including characteristics such as taste, odor, color, corrosivity, and hardness, for which maximum contaminant level goals (MCLGs) are specified.

The strengthened amendments of 1986 required the EPA to set standards and monitoring requirements for 83 drinking water contaminants by 1989 and for an additional 25 contaminants every three years. In 1988, the EPA specified a Drinking Water Priority List of contaminants that may be present in drinking water that pose a health risk and that may warrant regulation under the SDWA.

Primary drinking water regulations set forth by the SDWA specify certain criteria and procedures to ensure that a water supply is in compliance with the MCLs. The EPA is authorized under the SDWA to require any public water supplier to keep records, submit reports, conduct monitoring, and provide other information as required to comply with the SDWA.

The SDWA also stipulates stringent public notification requirements under specific conditions of noncompliance, including:

- an MCL violation
- failure to comply with an applicable testing provision
- failure to comply with any monitoring procedures

The State of California has assumed the primacy of enforcing the rules and regulations developed under the SDWA (Table 2). Potable water quality and monitoring are also regulated under California's Code of Regulations, Title 22, Division 4, Chapter 15, which establishes primary

and secondary drinking water standards for public water systems, including minimum water quality monitoring. Title 22's primary and secondary drinking water standards are derived from the national regulations.

The requirements for Title 22 are more stringent in most cases than the federal regulations. A brief summary is presented below for each of the major rules.

Table 2. Federal and State Drinking Water Regulations

Rule	State	Federal
Surface Water Treatment Rule (SWTR)	✓	
Total Coliform Rule (TCR)	✓	
Lead and Copper Rule (LCR)		✓
Phase II and Phase V (Synthetic Organic Chemicals and	✓	
Information Collection Rule (ICR), Proposed		✓
Disinfection Disinfection-By-Products Rule (D-DBP),		✓
Enhanced Surface Water Treatment Rule (ESWTR),		✓

Surface Water Treatment Rule (SWTR). The final SWTR was promulgated in 1989 and applies to all public water systems using surface water or groundwater under the direct influence of surface water. Disinfection is required for all public water systems by the SWTR. Filtration is also required unless a water utility can meet certain source water quality requirements, disinfection criteria, and other site specific requirements. The SFWD is currently pursuing renewal of its filtration avoidance status with the State Department of Health Services on its HH supply. The Rinconada Water Treatment plant provides conventional treatment of SCVWD's imported supplies. The City of Sunnyvale needs to maintain close contact with the SFWD and SCVWD to ensure that they are in compliance with all SWTR requirements.

Total Coliform Rule (TCR). The revised Total Coliform Rule, along with its accompanying monitoring requirements, became effective December 31, 1990. Compliance is based on the presence or absence of total coliform bacteria in samples, as a general indicator of contamination by microbial pathogens. For water systems that analyze more than 40 samples per month, such as Sunnyvale's, no more than 5 percent of the monthly samples may test positive for total coliforms. The City's wholesale suppliers provide the needed disinfection at the present time, and the City of Sunnyvale meets TCR requirements for the distribution system monitoring.

Lead and Copper Rule (LCR). The Lead and Copper Rule, promulgated June 7, 1991, sets active levels for lead and copper at 0.015 mg/L and 1.3 mg/L, respectively. The City performed the required monitoring, and the water system did not exceed the action level for lead or copper. Although not required, the SCVWD performed a corrosion control study for the entire system to assess the lead and copper contamination potential.

Phase II and Phase V. Phase II and Phase V set regulations for Synthetic Organic Chemicals and Inorganic Chemicals. Phase II, finalized on July 1, 1991, regulates a total of 38 chemicals, including MCLs for 8 inorganics, 10 volatile organic chemicals (VOCs), and 18 pesticides, herbicides, and PCBs, and treatment techniques for 2 drinking water treatment chemicals. Phase II also requires monitoring for 30 additional unregulated contaminants for some systems. Phase V, finalized July 17, 1992, regulates 23 more contaminants, including 4 inorganics, cyanide (for vulnerable systems), 3 VOCs, and 15 pesticides and synthetic organic chemicals (SOCs). The City has performed the required monitoring and has waivers from the State of California Department of Health Services for asbestos and SOC sampling requirements. The City meets all of the MCLs set forth by the EPA.

Information Collection Rule (ICR). The Information Collection Rule, promulgated May 14, 1996, establishes extensive requirements for microbial monitoring, disinfection-by-product (DBP) monitoring, and bench scale and/or pilot testing of organics removal at treatment plants. The EPA will assume full coordination of the data collection effort, and states will not be involved in its implementation. Implementation will be a large undertaking for both the EPA and the utilities. The SCVWD and SFWD expect to perform large-scale monitoring and testing for the ICR requirements. The purpose of the ICR is to collect enough information on the existence of microbial organisms in the natural water sources and on the ability of the treatment processes to reduce organic precursors and DBPs; the City does not expect to perform monitoring and testing to meet the ICR but will continue the coliform sampling as required by the TCR. The ICR process will take approximately two years.

Disinfection Disinfection-By-Products Rule (D-DBP). The purpose of the Disinfection Disinfection-By-Products Rule (D-DBP) is to reduce the health risks associated with disinfectants and their by-products. This rule sets MCLs for DBPs and maximum residual disinfectant levels (MRDLs) for disinfectants. Factors that influence the formation of DBPs include the amount of precursor, temperature, pH, and the bromide concentration of the source water. Disinfectant contact time and concentration are factors that directly impact the conversion of precursors to DBPs. The City needs to observe the SFWD and SCVWD's ICR compliance program and be actively involved in providing EPA public input in the promulgation of the D-DBP Rule. Regulation for D-DBPs is scheduled to be promulgated in two stages--the first after the completion of ICR data collection, at which time the THM standard will be lowered from the present 100 μg/L to 80 μg/L. Monitoring and treatment data collected under the ICR will be used to develop and refine the D-DBP Rule. The proposed rule for the second phase, originally scheduled for early 1998, has not yet been rescheduled.

Enhanced Surface Water Treatment Rule (ESWTR). The ESWTR, scheduled to be promulgated after the completion of ICR data collection, will enhance the current surface water treatment rule by establishing a MCLG of zero for *Cryptosporidium.* Monitoring required by the ICR will provide a basis for the EPA to decide whether the SWTR should be modified to ensure adequate protection against *Cryptosporidium.*

Water Quality Management and Monitoring. The potential for contamination of water sources exists from events such as vandalism, equipment breakdown, natural disaster, and

groundwater intrusion by contaminants. The impact of water quality degradation could result in shutdown of one or more sources of water, low pressure flows in some portions of the distribution system, and curtailed water usage.

The City has instituted a thorough and comprehensive water quality monitoring program to ensure that the system's water quality meets all regulatory requirements at all times. Staff also keep apprised of the latest water quality concerns, technical information, and regulatory developments through training classes sponsored by American Water Works Association, the EPA, the State Department of Health Services, and local and national water professional conferences.

In October 1988, the City developed an "Action Plan to Control the Distribution of Contaminated Water." This plan is currently undergoing revision, and includes:

a. an evaluation of the adequacy of the current monitoring program and sampling stations
b. identification of the "zone of influence" for each well, which indicates areas most likely to be affected by groundwater contamination
c. emergency isolation/mitigation procedures to be followed in the event contamination is detected in any of the City's three water sources
d. steps that must be taken to fulfill state and federal public notification requirements in the event water quality violations occur

The City's water quality management program covers the following areas:

- **City-Owned Wells.** The City currently operates eight wells. Because of the proximity of some wells to known underground contamination or industrial areas, monitoring for organic chemicals in the wells is performed on a monthly basis. The City has the ability to shut down any well without affecting the system's overall ability to deliver water for drinking and emergency purposes.

- **Private Wells.** Chemical contaminants in shallow aquifers throughout the industrial and commercial sections of Santa Clara County have raised concern that these contaminants may filter through old, abandoned agricultural wells to the deeper drinking water aquifers. More than 1,200 of these wells are estimated to exist throughout Santa Clara Valley, and less than half can be located by SCVWD. The unidentified wells are presumed to be covered under pavement, houses, private yards, and other developments that have replaced the orchards and fields.

  The SCVWD recently adopted an ordinance to locate and seal abandoned wells throughout the County. Funding is provided to seal these private wells. The SCVWD estimated that this program to locate and seal the wells will cost several million dollars in the next few years. However, it will have a positive impact on reducing the threat to the deeper groundwater aquifers. During the winter of 1995, approximately 50 of the abandoned wells were discovered when water came to the surface. These wells were sealed when this occurred.

- **Purchased Water.** Water purchased from SFWD and SCVWD originate from different sources and are subject to different water quality concerns. Both of these agencies have vigorous water quality monitoring and protection programs. San Francisco's HH source is pristine Sierra snowmelt, an unfiltered water source, and has been granted Filtration Avoidance status by the Department of Health Services of the State of California. As it is unfiltered water, naturally occurring parasites such as *Giardia* and *Cryptosporidium* may enter the water system. However, no cases have been linked to the City's water supply. The main concern of the Delta water supplied by SCVWD is the organics and bromides originating from agricultural return flow. These contaminants react with chlorine used for disinfection and produce potentially carcinogenic by-products. Control of these organics and the disinfection process have been primary focuses of the SCVWD.

For customers to experience varying water quality throughout the year is not uncommon, because there are three different water sources in Sunnyvale's system. These waters blend within the distribution system depending on the daily demand, seasonal fluctuations, and disruptions due to maintenance activities, resulting in water quality variances. In all cases the City's water quality meets or exceeds all federal and state requirements.

The City's water quality monitoring program is based on current regulations as outlined in the California Code of Regulations Title 22, Chapter 15, and the Code of Federal Regulations, 40 CFR Parts 141 and 142. Samples are analyzed by either the City's state-certified laboratory or an outside state-certified laboratory. All records are maintained and reports are filed with the State Department of Health Services as required. The City is in compliance with the requirements of its water quality monitoring program, and no MCLs or MCLGs have been exceeded. The details of the monitoring program are included in Appendix B and are summarized in Table 3.

Table 3. Water Quality Monitoring, City of Sunnyvale

Parameter	Number of Samples	Sample Frequency	Analyses
Bacteriology	• 46 (25 required) from distribution system • one from each operating well, imported water connection, and storage tank	weekly	• total and fecal coliform • total bacterial count
Disinfectant Residual	• 31 from distribution system • one from each operating well, imported water connection, and storage tank	weekly	• free and total chlorine (except wells) • Eterotrophic plate count (HPC) bacteria
Physical/Aesthetics	same locations as disinfectant residuals	weekly	• taste, odor, color, turbidity, pH, temperature
Hardness	all distribution system sampling locations	quarterly	• total hardness
Total Trihalomethanes (TTHMs)	Four samples per each imported water source (City-owned wells are not tested because they are not chlorinated.) • 25% of samples from extreme ends of distribution system • 75% of samples at locations representative of City's population distribution	quarterly	• TTHMs by GC
General Physical/ Mineral/Inorganic	Each City-owned well (Imported water is responsibility of wholesaler.)	3 years, except asbestos (9 years) and nitrate (1 year)	• general physical • mineral • inorganic (Specific analyses in Appendix A)
Radiochemicals	Each City-owned well (Imported water is responsibility of wholesaler.)	quarterly samples at 4-year intervals	• Gross alpha particle activity • Gross beta particle activity
Volatile Organic Chemicals (VOCs)	Each City-owned well (Imported water is responsibility of wholesaler.)	monthly	Specific VOC analyses in Appendix A
Synthetic Organic Chemicals (SOCs)	Two samples from each City-owned well (Imported water is responsibility of wholesaler.)	quarterly samples at 3-year intervals	Specific SOC analyses in Appendix A
Miscellaneous Tests	Additional tests and analyses performed as required to evaluate concerns identified by customer inquiries and complaints.		

Financial and Economic Aspects of Water Resources Management

The General Plan and Water Resources Management

In Sunnyvale, the General Plan serves as the City's vision for both short and long-term policy setting, budget planning, service delivery and evaluation. While most cities are required by state law to prepare a general plan outlining the direction of their community, few, if any, use the document like Sunnyvale does: as a foundation of all City planning and budgetary action.

Sunnyvale's General Plan is composed of seven elements: Transportation, Community Development, Environmental Management, Public Safety, Socio-Economic, Cultural and Planning and Management. This Water Sub-Element can be found under the Environmental Management element of the General Plan. Each element has a series of sub-elements in which long-range policy-making is developed and ultimately put into action via legislation decision (City ordinance, zoning changes, etc.) and budgetary allocations (capital improvement projects, funding of additional staff, etc.).

The City budget is viewed as an instrument to implement the General Plan. It is a service-oriented budget, designed to focus on the desired level of service provided to the community at a specific cost. The City budget is designed to communicate whether services provided implement the goals, policies, and direction that the Council believes is important to the community, as reflected in the City's long-range plan.

The Water Utility Fund

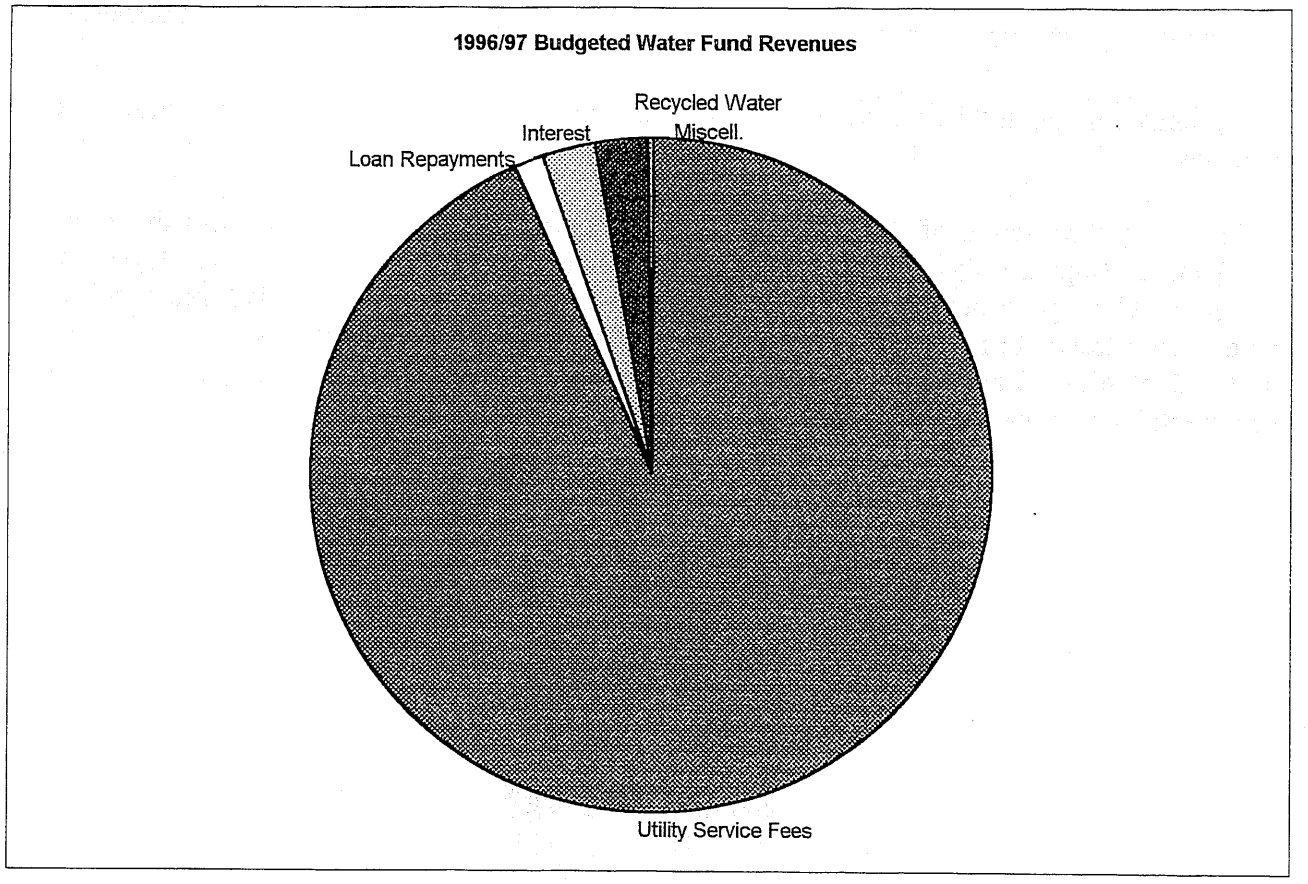
The Water Fund is one of three utility funds, including the Sewer Fund and the Refuse Fund, that make up the City's combined Utility Fund. The combined utility fund is used to balance capital expenditures and reserves at a more stable level to assist in the stabilization of rates over time. The Water Fund includes a 25% operating contingency as well as a 25% capital reserve. The capital reserve is used to fund needed infrastructure replacement projects for the water utility. The City is in the process of developing a comprehensive infrastructure management plan that will document the life expectancy and replacement costs for all portions of the water utility system as well as all other City-owned and operated facilities. This plan will develop life schedules likely to be in the 50-100 year range that will allow for a comprehensive funding of replacement of infrastructure over a long period of time. The schedule that will be developed for the infrastructure management plan will be reviewed annually and any changes to the type of equipment or the schedule for replacement will be approved in advance by the City.

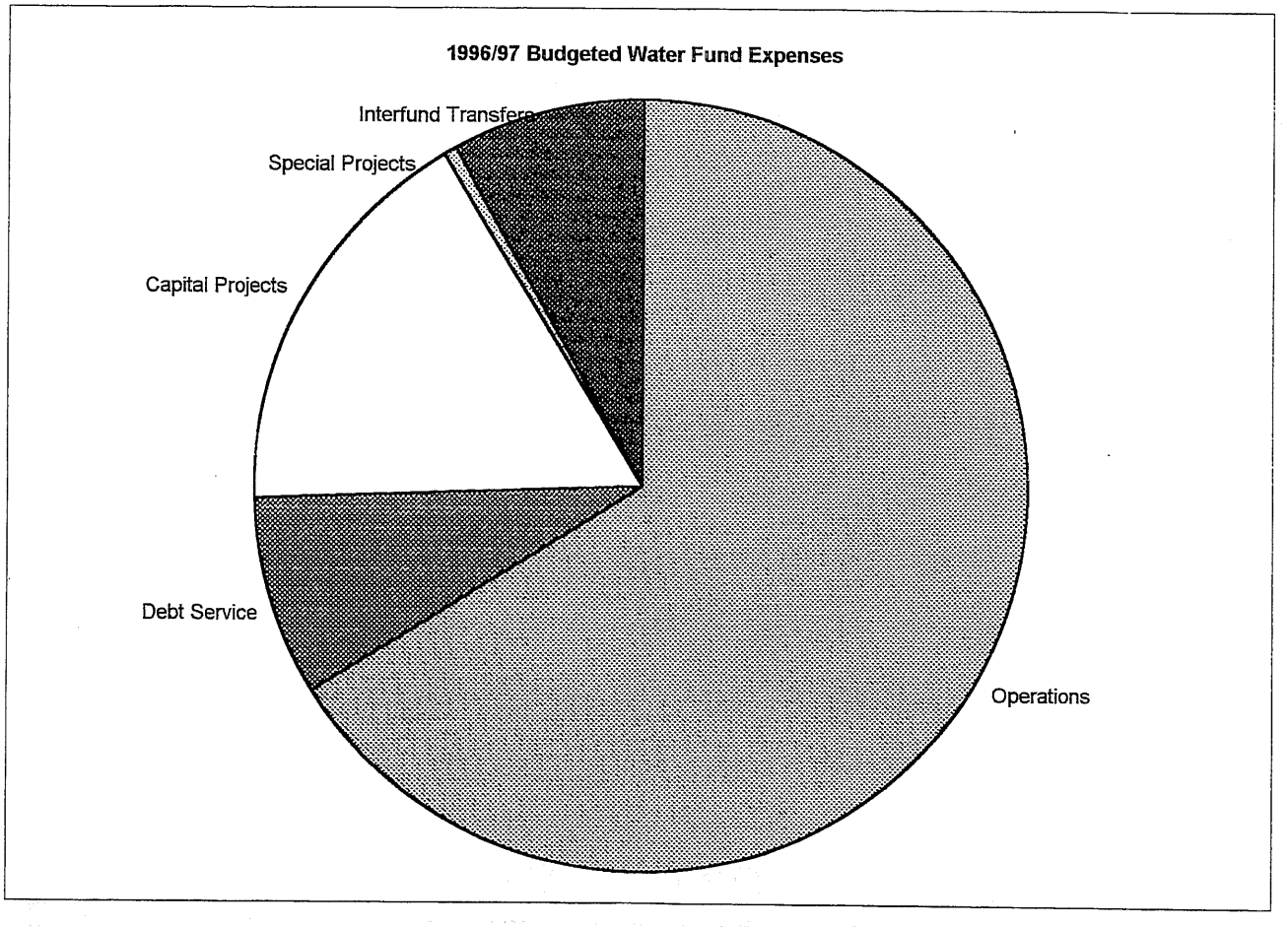
Sunnyvale bases its utility rates on the actual cost of providing service to customers. Utility rates for some other cities are not based on cost of service and some categories of customers may subsidize other categories.

The cost of service methodology is used consistently throughout the utility funds within the City. This method encourages residents and businesses to use our utility services in the most efficient way.

The graphs on the following page illustrate budgeted 1996-97 Water Fund expenses and revenues.

The budget for operation of the Water Fund is developed and approved along with the entire City budget. Capital projects are budgeted as part of the City's Capital Improvement Program. As with all City operations, a twenty-year budget forecast is also prepared. This forecast shows the expected trends in revenues and expenses for the program. The budget is used to project the trend of future water rates. Where rate increases are forecasted, rates can be increased incrementally to reduce the impact of the increase in any given year.

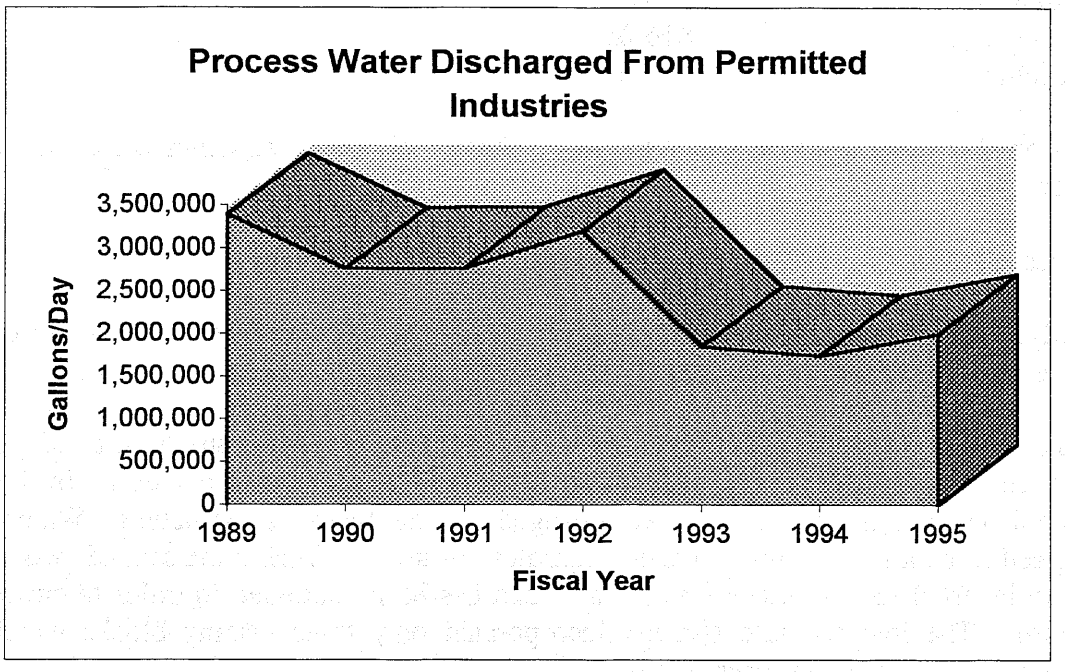

1996/97 Budgeted Water Fund Revenues
Recycled Water
Miscell.
Interest
Loan Repayments
Utility Service Fees


1996/97 Budgeted Water Fund Expenses
Interfund Transfers
Special Projects
Capital Projects
Debt Service
Operations

Water Resources and Economic Development

Water is a critical raw resource needed in a variety of industries in the valley, ranging from the fabrication of silicon chips to various food processing uses. As growth in population continues, businesses are becoming more sensitive to issues of water availability, garbage and sewer rates and other development related fees when deciding on a location for their operations.

Companies such as Lockheed-Martin, Advanced Micro Devices, Toshiba, and Rolm Corporation have implemented water sophisticated water reclamation and reduction programs. These programs are designed to not only reduce the water needs of the company, but also to reduce the heavy metal emissions into the City sewer system. Some examples include the installation of holding tanks for recycling, increasing the capacity of cooling towers, reducing rinse cycles during chip manufacturing, and installation of flow restrictors and auto shut off valves. As a result of these efforts by industry and the City's Industrial Waste Inspection Program, the amount of process water discharged by permitted industries has been reduced significantly, as the following graph illustrates:



Water Rates

Water rates are established annually by the City Council. Sunnyvale bases its utility rates on the philosophy that users of the services pay for the amount of services they receive. The City's goals for utility rates include assuring adequate long-term funding to pay for essential water, distribution facilities and services, as well as paying for state and federal environmental requirements.

Using long-term financial planning, the City attempts to keep utility rates as stable as possible. The City also focuses on keeping the costs of its utilities as low as practical while maintaining high quality service through effective planning and productivity improvements. Sunnyvale utility charges are very low compared to other South Bay cities. A comparison of water rates in Sunnyvale and neighboring cities in 1995 is as follows:

City	Average Residential Bill Per Month *
Palo Alto [1]	$27.74
Los Altos	$42.00
San Jose	$24.76
Mountain View	$24.78
Sunnyvale	$16.06
Santa Clara [1]	$16.05
Milpitas	$18.69

* Based on Bay Area Water Users Association Survey of 1995. Assumes usage of 11,220 gallons per month.

[1] Purchases electrical power from its own utility.

Periodically, the City reviews the methodology used to calculate the water rates to ensure that the rates reflect actual cost.

Prior to the 1976 drought, the City used a traditional declining block rate structure to administer its water rates. Under this scenario, the more water used, the less cost per unit. In the first year of the drought, this rate structure was changed to a flat block rate structure. Water rates were changed to be a flat amount per unit, regardless of usage. During the second year of the drought, an inverted rate structure was initiated and has been continued in order to encourage conservation. The inverted rate strategy incorporated only three pricing blocks which are applied differently to different user groups.

Lifeline Category. This rate block includes the first 600 cubic feet of water used each month. Forty percent (40%) of residential use falls within this block. For many other small users this rate block encompasses basic everyday use.

Conservation Category. The conservation block is intended to represent a cross-section of users where significant conservation should and must occur in time of limited water supply or drought. Based upon staff's examination of consumption patterns, it is clear that this rate block, for most single family homes, is the rate block wherein significant reductions in irrigation and domestic water use is possible.

High Use/High Impact Category. This rate block category connotes an essential and dramatic need for reduction when levels of use reduction higher than 30% are to be achieved. Utilization of significant amounts of water in this rate category simply should not be occurring or should be dramatically reduced if people are following basic conservation strategies.

For a more detailed description of the water rate structure, please see Appendix A.

Future Water Resources Management

Factors Impacting Future Water Resources Management

During the late 1960s and early 1970s, a number of major federal and state laws were enacted to both improve water quality assurance and to provide for environmental benefits. These included the California Porter-Cologne Water Quality Act of 1969, the California Environmental Quality Act of 1970, the National Environmental Policy Act of 1970, the Federal Clean Water Act of 1972, and the Federal Wild and Scenic Rivers Act of 1972. In 1982, in California the DWR and the WRCB adopted a joint policy regarding water resources management for the state. Key elements are:

1. Water resources already developed shall be used to the maximum extent before new sources are developed.

2. Water quality objectives, beneficial uses, and water quality control plans and policies adopted by the state WRCB and the regional WQCB shall be an integral part of the basis for water resources management.

3. Surface water and groundwater supplies and storage capacities shall be used to obtain the greatest practical yield and still protect water quality. While planned variation and groundwater pumping is essential to the regulation of a variable supply to satisfy the relatively uniform annual demand, groundwater overdraft is not consistent with sound water resources management practices.

4. Water development plans shall achieve maximum practicable conservation and efficient use of the waters of the state.

5. Water shall be reclaimed and reused to the maximum extent possible.

6. Point sources and non-point sources of pollution shall be controlled to protect adopted beneficial uses of water.

7. To maintain water flows necessary for environmental habitats.

8. Methods of preventing property damage or loss of life due to floods must consider flood plain zoning, flood proofing, flood warning systems, and similar nonstructural measures, as well as construction of facilities such as dams, reservoirs, and levees.

9. Energy consideration shall be made an integral part of the water resources planning process.

This policy has been used as a guide by local agencies to manage their water resources.

In recent years, U.S. Senator Hodell introduced legislation requiring the demolition of O'Shaugnessy Dam in Yosemite National Park and the restoration of SFWD's Hetch Hetchy Reservoir to its original state. This proposed legislation could have a dire impact on approximately 30 water utilities in the San Francisco Bay Area and its two million users. Other legislation has been introduced at both the state and federal levels to divert water supply from urban areas or release waters from SWP and/or CVP reservoirs for enhancement of spawning fish and other wildlife. As several rivers in the northwest part of the state have been designated as Wild and Scenic, construction of water supply storage reservoirs and developing new sources is unlikely.

With DWR's forecasts that the population of the state will reach 49 million by the year 2020, resulting in an urban water use increase of 50% over today's demands, protection of existing resources combined with demandside management become the focal point of recent resources management programs.

In 1984, the California Urban Water Management Planning Act was adopted for the specific purpose of better demand management input by the water utilities. The act mandates the submittal of an Urban Water Management Plan to the state and an updated version of this plan by December 1995. Specific demand management practices are to be implemented in accordance with the City's Plan.

The DWR also enacted rules requiring major water suppliers to develop best management practices for water use. In conjunction with SCVWD, the City has co-signed a memorandum of understanding (MOU) with DWR. The SCVWD has the primary responsibility for implementing demand side management programs in Santa Clara County, including ultra-low flush toilet rebate programs and audits of large water users.

On the water quality side, since the amendment of the SDWA in 1986, the EPA has promulgated the Surface Water Treatment Rule, Total Coliform Rule, Lead and Copper Rule, and Phase II and Phase V monitoring requirements. Additional rule-making underway includes the Information Collection Rule, the Disinfection Disinfection-By-Product Rule, and the Enhanced

Surface Water Treatment Rule. These requirements have been developed to protect public health. However, their implementation requires substantial resources to monitor and administer the programs for a municipal utility like Sunnyvale. For wholesale suppliers like SFWD and SCVWD, additional source protection , treatment facilities, and monitoring are required.

Recent developments impacting water resource management include the following federal and state activities:

Raker Act Amendment. SFWD has been paying an annual fee of $30,000 for use of the Hetch Hetchy park lands. A bill was passed by Congress in 1995 to increase the fee to $570,000. The suburban customers' rates will be approximately $0.002 per hundred cubic feet.

Tuolumne River Restoration Agreement. The Federal Energy Regulatory Commission (FERC) is considering approval of an agreement between the City of San Francisco and the Modesto and Turlock Irrigation Districts which would triple water release from the new Don Pedro Dam during months of critical importance to salmon spawning, incubation and migration. These releases are being proposed to restore salmon habitats and increase salmon population along the lower Tuolumne River. The current level of seasonal discharge of 94,000 acre-feet is expected to increase to 300,000 acre-feet. The salmon population along the Tuolumne has dramatically decreased in recent years, from about 100,000 in the 1980s to 1,200 in 1995. Under the agreement, the City of San Francisco would pay $3.5 million per year to the Modesto and Turlock Irrigation District to flush river flatland flows and reduce pollution levels. An additional $1.2 million will be paid for riverside improvements, recreational facilities and a biologist monitor. The estimated impact to Sunnyvale residents is $0.034 per hundred cubic feet.

Sunol Filtration Plant Violations. SFWD's Hetch Hetchy water supply has obtained Filtration Avoidance from the State Department of Health Services, provided all COR Title 22 requirements are met. In March 1995 during the extreme storm periods, the Sunol Filtration plant filtered water effluent failed to meet the Title 22 turbidity requirements. The SFWD is undertaking many corrective measures to ensure future compliance and maintenance of the Filtration Avoidance status. System improvements may include additional diversion pipelines, balancing reservoirs, or ozonation facilities resulting in substantial capital, operation, and maintenance expenditures. If filtration is mandated by the DHS, the suburban customers' share of the cost could be in the range of $0.11 to $5.57 per hundred cubic feet.

Central Valley Project Improvement Act (CVPIA). The CVPIA set aside 800,000 acre-feet a year for fish and wildlife purposes and consequently decreased the availability of the CVP water for its contractors, including SCVWD. The existing Act provides financial incentive for contractors to renew their contract in the next two to three years for a term of 25 years without a renewing provision. A surcharge will be applied starting in the year 2027. The SCVWD may opt to renew its contract and seek a guaranteed renewal every 25 years. There are bills pending in the House to amend the CVPIA. The amendments include some 30 area relief bills for the agricultural interests with a wide range of impacts, and are not supported by SCVWD. However, it potentially increases the reliability of the CVP supply by providing a minimum 75%

guarantee to CVP contractors' entitlements.

CVP Buyout. There is legislation introduced proposing the buyout of the CVP. A CVP Joint Powers Association (JPA) has formed to assess the possibility. The present value of the project, based on future payment stream for the next 40 years, is estimated to be about $800 million. If passed by congress, the JPA may elect to sell off different elements of the project and SCVWD may elect to purchase the San Felipe Division (17% of the CVP) to provide additional flexibility for operating its system. The financial impact on SCVWD customers is uncertain at present.

Bay/Delta Accord. The California Water Plan, being updated by the DWR, predicts that with the implementation of all viable improvement options by the year 2020, a potential shortfall of 2 to 4 million acre-feet remains in average years and 3 to 5 million acre-feet in drought years. This is because urban water demand is projected to grow by 50% from the current 32 million acre-feet to 49 million acre-feet in the year 2020, even with extensive water conservation. Crop changes and reductions in agricultural acreage may reduce agricultural use by 7%, but demands for environmental conservation, such as the restoration of habitat for winter-run salmon and other fisheries and the protection of the remaining wild and scenic rivers in California, are increasing. Larger volume releases from state reservoirs during summer dry periods will be required. As more rivers in northern California are designated as Wild and Scenic, development of new storage reservoirs to increase supply is highly unlikely, if not impossible.

In December 1994, a three-year agreement on principles was reached among the Cal-Fed group, which included the EPA, the DWR, and representatives from the agricultural, environmental, and urban water supplier communities. This three-year accord provides a basis for addressing a long-term solution for Bay/Delta water resources management.

A stakeholder group consisting of seven major urban water users, seven agricultural users, and seven environmental/fishing interest groups has been formed to explore long-term Bay/Delta water resources management alternatives for the Cal-Fed to proceed with the CEQA/NEPA environmental review process. Major issues identified are the need for ecosystem restoration, water reliability, drinking water quality, and planning for natural disasters such as Delta levee failures. The need for an integrated long-term solution that incorporates increased conservation, water recycling, conjunctive use, transfers, and additional water supply facilities has been identified. Appropriate legal protections and institutional changes are also recognized as requirements to implement the long-term solution. Local, state, and federal programs need to be closely coordinated to maintain adequate flows and water quality for fisheries and expansion of aquatic habitat.

The SCVWD is represented on the 21-member stakeholder group and is actively involved in crafting alternative long-term approaches to the Bay/Delta that will address both water supply reliability for Santa Clara County and the environmental needs of the Bay/Delta. Input is also provided to SB900 regarding state funding for the proposed programs. The SB900 (Costa) was a bill introduced recently for issuance of general obligation bonds to fund a wide array of water programs including potable water and wastewater, flood control, water recycling, agricultural

drainage, non-point source pollution, the state's share of CVPIA funding, a comprehensive Bay/Delta program, fish screening and enhancement of the San Joaquin Valley drainage relief program, and conservation efforts to increase groundwater supply. The bill will require voter approval in the November 1996 election.

Monterey Agreement. The State Water Contractors recently reached an agreement with the DWR in making an additional 130,000 acre-feet of agricultural use water available for purchase by urban contractors. The SCVWD is considering the purchase of 20,000 acre-feet of entitlement. The Monterey Agreement also allows the contractors using State Project facilities and non-state water project facilities to facilitate water banking and transfer, which increases the operational flexibility of the SWP contractors dramatically. On November 21, 1995, the SCVWD Board of Directors approved the contract with the DWR to implement the provisions of the Monterey Agreement.

Future Trends in Water Resources Management

Sources of Supply and Water Supply System. The quantity of available imported water to the City may be significantly reduced in the future because of competing interests for freshwater by both the SCVWD and SFWD. As a result, the City should be proactive in working with these suppliers to maximize the available water supply.

Well-water pumping in the City will be more strictly managed by SCVWD, due to the reduction in aquifer storage capacity and the reduction in surface water available for recharge purposes. The cost of well-water is likely to be higher as a result of this trend. The purpose of any increases will be to encourage the use of surface water supplies and to preserve existing groundwater tables for drought periods.

The age of the existing water distribution system ranges from 30 to 50 years. The physical condition of water facilities in older areas of the City will begin to deteriorate, requiring additional maintenance, upgrading, and replacement. The new infrastructure management system will provide tracking of the system conditions so that replacement needs can be assessed.

Because SFWD's system currently does not provide adequate storage for customer peaking purposes, the State Department of Health Services may require retail customers of SFWD to provide adequate storage for its own peaking operation. As a result, the City may be required to evaluate its storage capacity and work with SFWD to develop regional storage areas. As an alternative to a regional storage facility, the City may wish to add additional wells, rehabilitate existing wells, or construct storage reservoirs to meet storage requirements.

Current environmental laws and other laws make it highly infeasible to develop major new sources of water supply in California. Laws implemented to protect wild and scenic rivers, endangered species, fishing interests, and other special interests make it unlikely that water supply growth will keep up with increases in demand. Therefore, innovative demand side management programs will have to carry the load into the future in balancing supply vs.

demand. Techniques such as water banking, water transfers, conjunctive use, water reclamation, plumbing retrofits, Xeriscaping, rate structures encouraging conservation, and other demand side management options will have to be put into effect.

Since over 85% of the water used in California is for agricultural purposes, finding efficient irrigation techniques and planting less water-dependent crops could significantly affect the state's water supply. Long-term solutions for existing Delta problems will also maximize water supplies passing through the Delta.

One possible scenario for increasing water supply is the use of off-stream reservoirs south of the Delta to capture water during years of heavy run-off. One such reservoir is San Luis Reservoir. Another off-stream reservoir, called Los Banos Grande, is currently in the planning stages.

Water Demand and Demand Management. The growing trend of water demand, in both residential and industrial sectors, is one of stability. Due to water conservation, regulatory compliance in pollution prevention, and the change in industrial types and water use characteristics, the City should continue its efforts to encourage the use of reclaimed water for non-potable uses and encourage potable use conservation through public education programs.

Water Quality Management. Water quality regulations are becoming more stringent. Operational flexibility needs to be maintained to ensure regulatory compliance. The conjunctive operation of wells and surface supply and the adequacy of storage needs to be evaluated from a regulatory compliance perspective.

Additional water quality monitoring will be mandated by the state and the EPA, which will increase the operational budget of the water system and the cost of imported waters. Rates are likely to increase as a result of this increased regulation. In addition, State DHS may mandate SFWD to filter the Hetch Hetchy water supply, resulting in a substantial cost increase of SFWD water.

Customer Service and the "Core Outcome" of Water Resources

In developing goals and policies for the water utility, the key question the City should ask itself is, from our customers' perspective, what should be the core outcome of the City's water program. All the goals, policies, and action statements contained in the Water Resources Sub-Element should be designed to accomplish this core outcome, which is broad-based, simple to understand, and establishes the purpose of all activities. A mission statement for the water utility might be "to ensure that customers are confident that the City is providing reliable, safe, affordable, and aesthetically pleasing water to their homes and/or businesses." The goals, policies, and action statements should be developed to accomplish this purpose as the City moves toward service outcome structures for all of its programs.

Although the strategies outlined in this Sub-Element are intended to be long term in nature, new programs and services are being developed and existing programs in water resources may need

to be restructured to enhance our ability to serve our customers. These programs will essentially become the organizational tools necessary to achieve the long-term goals of the City.

The proposed core outcomes will be clean, understandable mission statements for service delivery. They will be used to clearly communicate to the Council, Boards and Commissions, community, and staff, the effectiveness and efficiency of the services the City provides. The new system, like the current one, will maintain a strict level of accountability, yet allow for flexibility. The communications program will involve:

- Communications with Our Customers
- Customer Satisfaction Surveys
- Customer Verification Surveys

Communications with Our Customers. Through the years, the City has continued to expand its program of providing information to the general public. In the water resources area, these communications have included a number of direct mailers sent out to every resident and business in Sunnyvale, such as the drought communication during the 1987-1992 drought. These reports provided information on the status of the water supply and the necessary conservation levels at the time, provided tools and ideas for customers to achieve the necessary conservation goals, informed customers regarding water usage restrictions and rate structures, and served as a mechanism for customers to provide feedback (on survey forms) to the City's water utility.

In addition, the City will continue publication of an annual water quality report. This will provide information regarding the City's Quality Assurance Program and the most recent test results showing how the utility is meeting the various state and federal standards for water quality.

The City staff intends to continue to communicate with its customers through these existing tools. In the future, additional tools include the use of the World Wide Web on the Internet.

Customer Satisfaction Surveys. The surveys will be designed to retrieve customer feedback on the level of satisfaction of the delivered services. The surveys will also provide a vehicle for customers' input on their expectations. Future programs will be structured to contain outcomes directly measured through these surveys.

Customer Verification Surveys. In addition to monitoring customer satisfaction, it will be important to verify measurable information through our customers. Items such as response time, quality of service from our staff, ability to get through to our staff on the phone, etc., will be measured through this verification process.

All of the above information on outcome orientation, customer satisfaction surveys, and customer verification surveys is in the development stage. It is anticipated that the new structures and outcomes will be developed within the next few years. The goals and policies have been developed in an attempt to capture both the traditional and the new outcome-oriented service delivery approach.

Community Condition Indicators

Proposed community condition indicators are presented below in Table 4. Indicators deleted from the existing table are annual consumption per acre, production capacity of wells, and energy cost for water produced.

TABLE 4.
ENVIRONMENTAL MANAGEMENT
Community Condition Indicators

		Actual 1992-93	Actual 1993-94	Actual 1994-95	Projected 1995-96
3.1	Millions of gallons of water sold annually:				
	A. Residential	3,992	4,526	4,201	4,500
	B. Other	2,872	3,257	2,839	3,050
3.2	Average daily water demand in million gallons	18.8	21.3	20.6	20.7
3.3	Miles of City water mains and appurtenances	282	282	282	282
3.4	Water use peak/minimum day in million gallons	38/13	39/13	42/11	40/10
3.5	Cost to delivery water ($/100 cubic-feet)	1.08	.88	.94	.96
3.6	Unit cost for well water ($/acre-foot)	347	315	331	330
3.7	Unit cost for SCVWD water ($/acre-foot)	335	316	312	315
3.8	Unit cost for SFWD water ($/acre-foot)	438	288	335	320
3.9	Annual consumption per acre (acre-foot/acre)	1.3	1.5	1.4	1.4
3.10	Water services	27,631	27,700	27,925	27,950
3.11	Fire hydrants	3,273	3,280	3,280	3,288
3.12	Storage capacity (million gallons)	28	28	27.5	27.5

ENVIRONMENTAL MANAGEMENT
Community Condition Indicators

		Actual 1992-93	Actual 1993-94	Actual 1994-95	Projected 1995-96
3.13	Wells/production capacity (gallons/minute)	11/8,400	11/8,400	9/6,500	9/6,500
3.14	Energy cost for water produced ($/acre-foot)	17	16	14	14
3.15	Number of samples collected for testing	6,182	6,789	6,821	6,700
3.16	Curb miles of streets that require sweeping	660	660	660	665
3.17	Miles of storm water lines	139	139	139	140
3.18	Drop inlets in storm drainage system	3,280	3,290	3,290	3,528
3.19	Miles of sanitary sewer mains	285	285	285	290
3.20	Millions of gallons of liquid wastes treated per year	4,666	4,840	5,584	4,900
3.21	Average daily volume of liquid wastes in millions of gallons	12.8	13.3	13.5	13.5
3.22	Average dry weather (May-October inclusive) liquid waste flow per day as a percentage of treatment plant design capacity	43.4%	45.1%	45.5%	45.5%
3.23	Redevelopments and utility additions which require map updates	19	20	18	19
3.24	Subdivision construction permit applications	7	10	7	7
3.25	Development permit applications	4	3	2	3

ENVIRONMENTAL MANAGEMENT
Community Condition Indicators

		Actual 1992-93	Actual 1993-94	Actual 1994-95	Projected 1995-96
3.26	New developments requiring map changes	11	13	13	12
3.27	Street cut permit applications	230	235	155	160
3.28	Air pollution: Days ozone standards exceeded per year	2	2	6	7